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	DISPLAY DEVICE DIVISION 5 DISPLAY DEVICE BUSINESS GROUP SHARP CORPORATION **SPECIFICATION**	

DEVICE SPECIFICATION FOR

TFT-LCD module

MODEL No. LK200T3HA04W

CUSTOMER'S APPROVAL

DATE _____

BY _____

PRESENTED

BY K. Tanaka for

K.CHOHKA
GENERAL MANAGER
DISPLAY DEVICE DIVISION 5
DISPLAY DEVICE BUSINESS GROUP
SHARP CORPORATION

RECORDS OF REVISION

MODEL No. : LK200T3HA04W

SPEC No. : LD- K24Y18

DATE	NO.	REVISED No.	PAGE	SUMMARY	NOTE
2012.11.28	LD- K24Y18	-	-	-	1st Issue

1. Application

This specification applies to the color 20.0" TFT-LCD Open-Cell (LK200T3HA04W).

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* Do not use the device for equipment that requires an extreme level of reliability, such as aerospace applications, telecommunication equipment (trunk lines), nuclear power control equipment and medical or other equipment for life support.

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* Contact and consult with a SHARP sales representative for any questions about this device.

2. Overview

This Open-Cell is a color active matrix LCD panel incorporating amorphous silicon TFT (Thin Film Transistor). It is composed of a color TFT-LCD panel, polarizer, driver ICs and Source-Control PWB.
Graphics and texts can be displayed on a 1366×RGB×768 dots panel with 16,777,216 colors by using LVDS (Low Voltage Differential Signaling) for the interface and +12V DC supply voltage, which are put into Source-Control PWB.

This applies the Over Shoot driving (O/S driving) technology, signals are being applied to the Liquid Crystal according to a pre-fixed process as image signals of the present frame when a difference is found between image signals of the previous and current frame by comparing each other. The O/S driving technology makes the Liquid Crystal response within 1 frame completely, motion blur reduce, so that clearer display performance can be realized.

3. Mechanical specifications

Parameter	Specifications	Unit
Display size	50.891 (Diagonal)	cm
	20.0 (Diagonal)	inch
Active area	443.609 (H) × 249.408 (V)	mm
Pixel Format	1366 (H) × 768 (V) (1pixel = R + G + B dot)	pixel
Pixel pitch	0.32475(H) × 0.32475 (V)	mm
Pixel configuration	R,G, B vertical stripe	
Display mode	Normally black	
Outline Dimensions [Note1]	468.4(W) × 275.0(H) × 1.8(D)	mm
Mass	0.49	kg
Surface treatment [Note2] (Polarizer)	Low-Haze Anti Glare, Hard coating Surface Hardness; 2H: CF side (Front) <6B: TFT side (Rear)	

[Note1] Outline dimensions are shown in P16.
[Note2] Without the protection film.

4. Interface specifications

4.1. TFT panel driving

CN1 (Interface signals and +12V DC power supply; shown in Fig.1)

Used connector: IS100-L30R-C15 (UJU)

Mated connector: FI-X30H/FI-X30HL, FI-X30C/FI-X30C2L
or FI-X30M (Japan Aviation Electronics Ind. , Ltd.)

Mated LVDS transmitter: THC63LVDM83R (THine) or equivalent device

Pin No.	Symbol	Function	Remark
1	VCC	+12V Power Supply	
2	VCC	+12V Power Supply	
3	VCC	+12V Power Supply	
4	VCC	+12V Power Supply	
5	GND	Ground	
6	GND	Ground	
7	GND	Ground	
8	GND	Ground	
9	SELLVDS	Select LVDS data order [Note 1]	Default: Pull down (L:GND) [Note 2]
10	Reserved	Not Available	
11	GND	Ground	
12	RIN0-	Negative (-) LVDS differential data input	LVDS
13	RIN0+	Positive (+) LVDS differential data input	LVDS
14	GND	Ground	
15	RIN1-	Negative (-) LVDS differential data input	LVDS
16	RIN1+	Positive (+) LVDS differential data input	LVDS
17	GND	Ground	
18	RIN2-	Negative (-) LVDS differential data input	LVDS
19	RIN2+	Positive (+) LVDS differential data input	LVDS
20	GND	Ground	
21	CLKIN-	Clock Signal(-)	LVDS
22	CLKIN+	Clock Signal(+)	LVDS
23	GND	Ground	
24	RIN3-	Negative (-) LVDS differential data input	LVDS
25	RIN3+	Positive (+) LVDS differential data input	LVDS
26	GND	Ground	
27	Reserved	Not Available	
28	Reserved	Not Available	
29	Reserved	Not Available	
30	Reserved	Not Available	

[Note] GND of a liquid crystal panel drive part has connected with a module chassis.

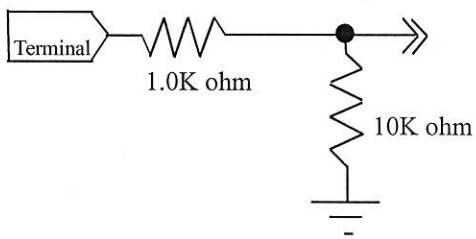
[Note1] LVDS data order

Transmitter		SELLVDS	
Pin No	Data	= L(GND) or Open	= H(3.3V)
51	TA0	R0(LSB)	R2
52	TA1	R1	R3
54	TA2	R2	R4
55	TA3	R3	R5
56	TA4	R4	R6
3	TA5	R5	R7(MSB)
4	TA6	G0(LSB)	G2
6	TB0	G1	G3
7	TB1	G2	G4
11	TB2	G3	G5
12	TB3	G4	G6
14	TB4	G5	G7(MSB)
15	TB5	B0(LSB)	B2
19	TB6	B1	B3
20	TC0	B2	B4
22	TC1	B3	B5
23	TC2	B4	B6
24	TC3	B5	B7(MSB)
27	TC4	NA	NA
28	TC5	NA	NA
30	TC6	DE(*)	DE(*)
50	TD0	R6	R0(LSB)
2	TD1	R7(MSB)	R1
8	TD2	G6	G0(LSB)
10	TD3	G7(MSB)	G1
16	TD4	B6	B0(LSB)
18	TD5	B7(MSB)	B1
25	TD6	NA	NA

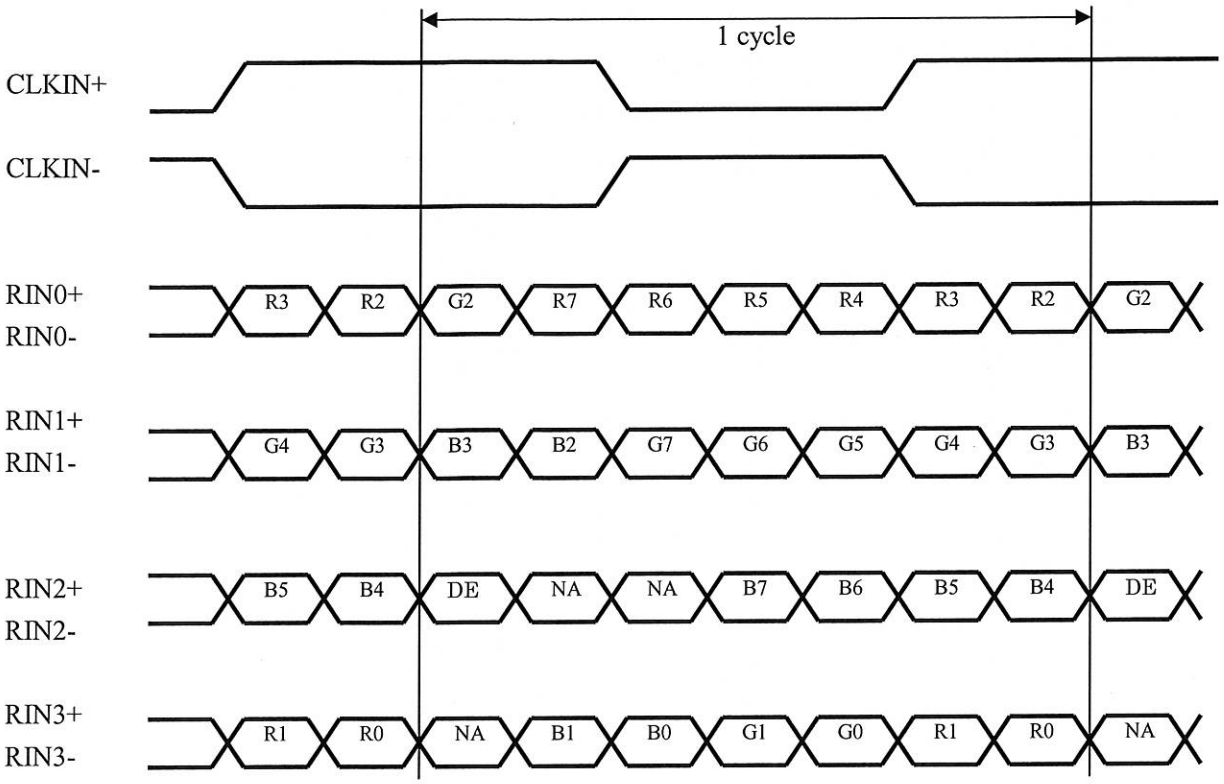
NA: Not Available

(*) Since the display position is prescribed by the rise of DE (Display Enable) signal, please do not fix DE signal at "High " during operation.

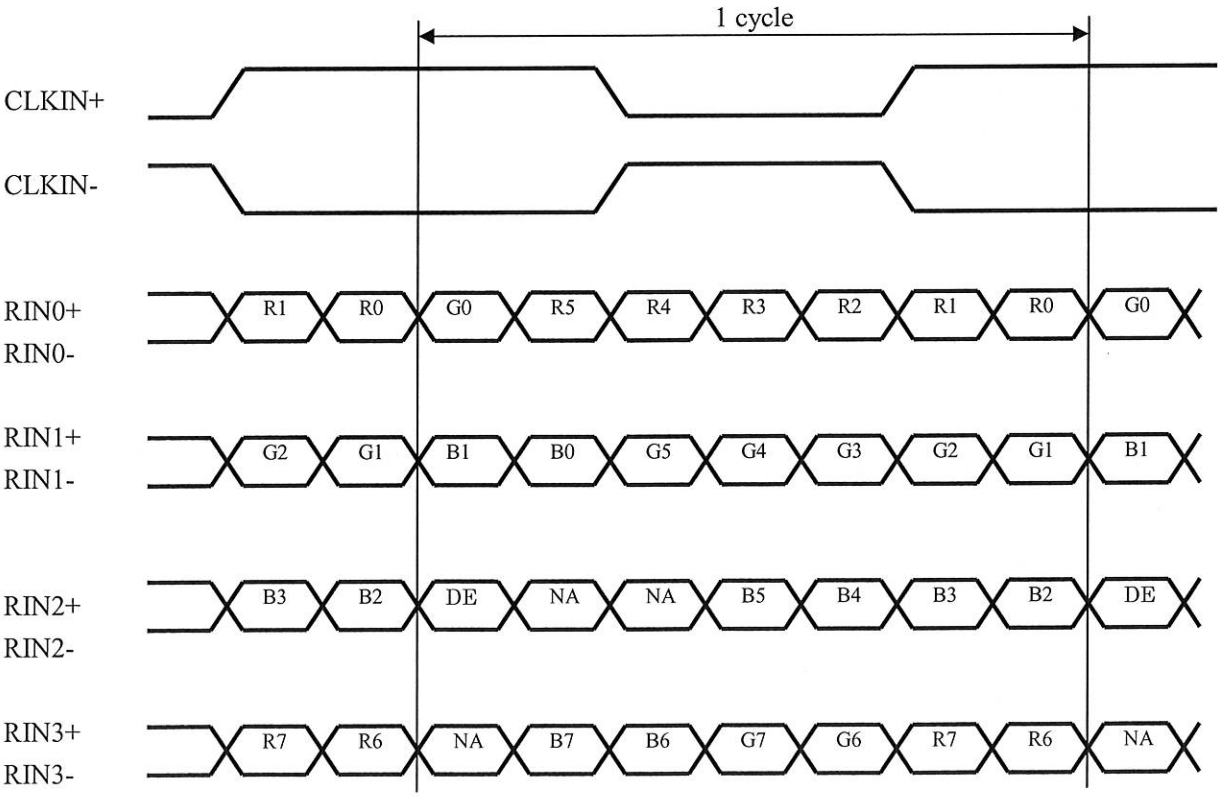
[Note 2] The equivalent circuit figure of the terminal



SELLVDS= High (3.3V)



SELLVDS= Low (GND) or Open



DE: Display Enable

NA: Not Available (Fixed Low)

4.2. Interface block diagram

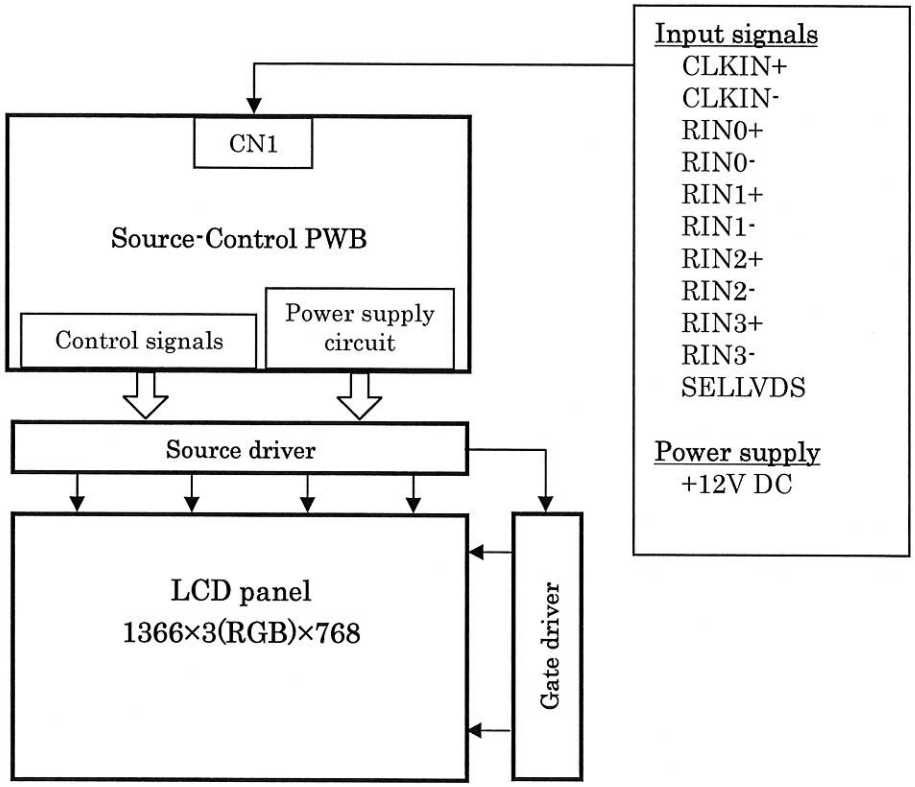
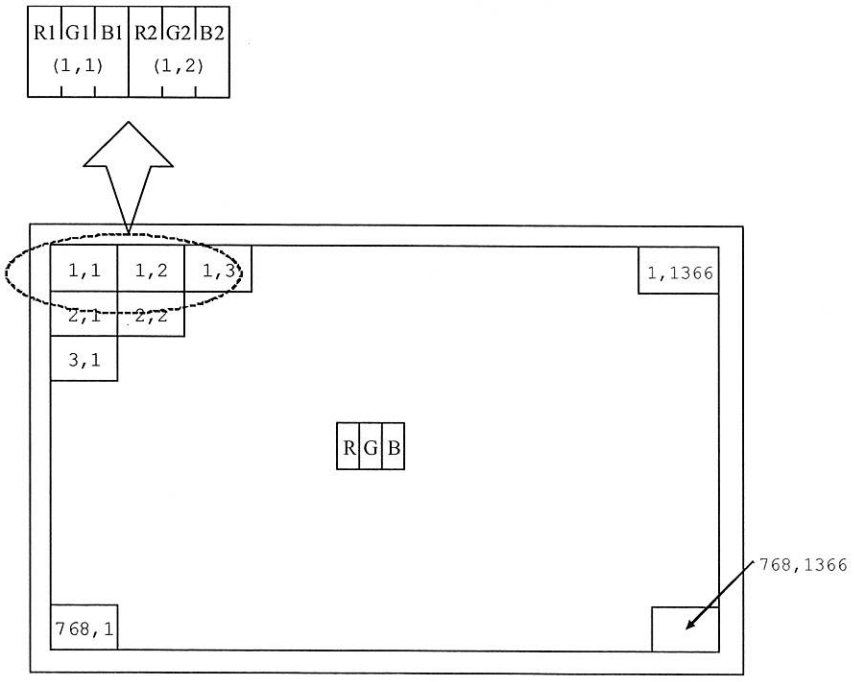


Fig.1 Interface block diagram

4.3. Display position of data



Display Position of Data (V,H)

5. Absolute maximum ratings

Parameter	Symbol	Condition	Ratings	Unit	Remark
Input voltage (for Source-Control PWB)	V_I	Ta=25°C	-0.3 ~ 3.6	V	[Note 1]
+12V supply voltage (for Source-Control PWB)	V_{CC}	Ta=25°C	0 ~ +15	V	
Vcom control voltage	V_{CTL}	Ta=25°C	-0.3 ~ +16	V	
Chip enable voltage	V_{CE}	Ta=25°C	-0.3 ~ +4	V	
Storage temperature	Tstg	-	-25 ~ +60	°C	[Note 2]
Operation temperature (Ambient)	Topa	-	0 ~ +50	°C	

[Note 1] SELLVDS

[Note 2] Humidity 95%RH Max.(Ta ≤ 40°C)

Maximum wet-bulb temperature is 39°C or less (Ta > 40°C). No condensation.

6. Electrical characteristics

6.1. Electrical characteristics of input signals

Ta=25°C

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
+12V supply voltage	Supply voltage	V_{CC}	+11.4	+12.0	+12.6	V	[Note 1]
	Current consumption	I_{CC}	-	240	300	mA	[Note 2]
		I_{RUSH}	-	-	3600	mA	[Note 5]
		T_{RUSH}	-	0.5	-	ms	[Note 5]
Permissible input ripple voltage		V_{RP}	-	-	100	mV_{P-P}	Vcc = +12.0V
Differential input threshold voltage	High	V_{TH}	-	-	100	mV	*V_{CM} = +1.2V [Note 4]
	Low	V_{TL}	-100	-	-	mV	
Input low voltage		V_{IL}	0	-	0.7	V	[Note 3]
Input high voltage		V_{IH}	2.6	-	3.3	V	
Input leak current (Low)		I_{IL}	-	-	400	μA	V_I = 0V [Note 3]
Input leak current (High)		I_{IH}	-	-	100	μA	V_I =3.3V [Note 3]
Terminal resistor		R_T	-	100	-	Ω	Differential input

[Note] *V_{CM}: Common mode voltage of LVDS driver.

[Note 1]

Input voltage sequences

50us < t1 ≤ 20ms

20ms< t2-1

20ms< t2-2

0 < t3 ≤ 1s

t4 ≥ 1s

t5 ≥ 300ms

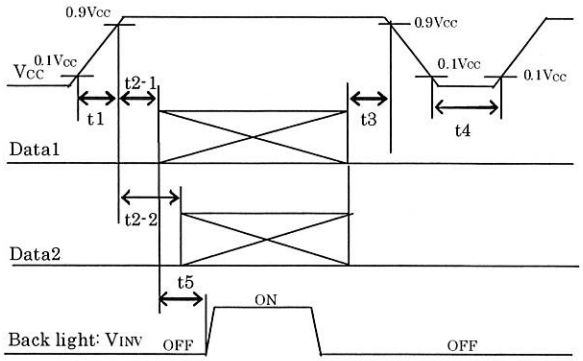
Dip conditions for supply voltage

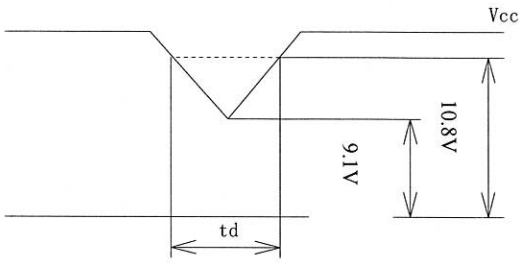
a) 9.1V ≤ V_{CC} < 10.8V

td ≤ 10ms

b) V_{CC} < 9.1V

Dip conditions for supply voltage is based on input voltage sequence.





※ Data1: CLKIN±,RIN0±,RIN1±, RIN2±, RIN3±

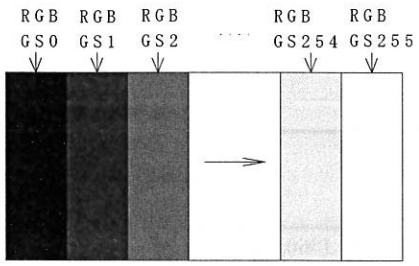
※ Data2: SELLVDS

※ About the relation between data input and back light lighting, we recommend the above-mentioned input sequence.

If the back light is switched on before a panel operation begins or after a panel operation stops, the screen may not be displayed properly. But this phenomenon is not caused by change of an incoming signal, and does not give damage to a liquid crystal display.

[Note 2]Typical current situation: 256 gray-bar pattern (V_{CC} = +12.0V)

The explanation of RGB gray scale is seen in section 8.

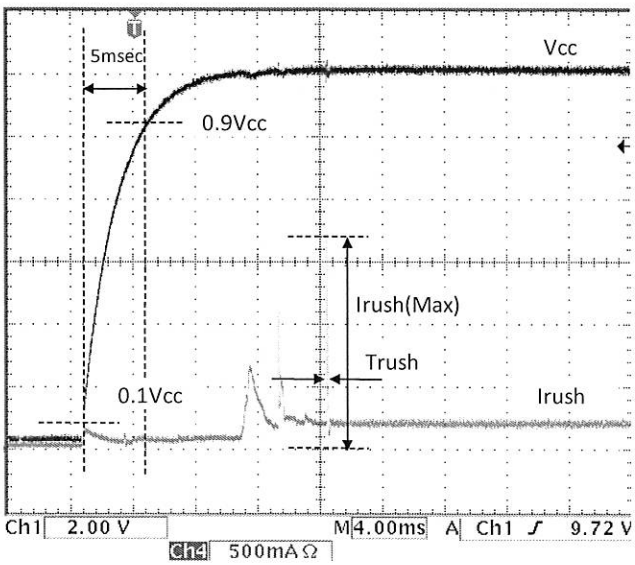


V_{CC} = +12.0V
CK = 82.0MHz
Th = 20.68μs

[Note 3] SELLVDS

[Note 4] CLKIN+/CLKIN-, RIN0+/RIN0-, RIN1+/RIN1-, RIN2+/RIN2-, RIN3+/RIN3-

[Note 5] The rush current corrugation at the time of power on



6.2. Timing characteristics of input signals

Timing diagrams of input signal are shown in Fig.2

Parameter		Symbol	Min.	Typ.	Max.	Unit
Clock	Frequency	1/Tc	72	82	85	MHz
Data enable signal	Horizontal period	TH	1540	1696	1940	clock
			19.84	20.68	-	μs
	Horizontal period (High)	THd	1366	1366	1366	clock
	Vertical period	TV	778	806	972	line
	Vertical period (High)	TVd	768	768	768	line

[Note] *When a vertical period is very long, a flicker may occur.

*Please turn off the module after it shows the black screen.

*Please make sure that a length of vertical period should be an integral multiple of horizontal period, otherwise the screen may not display properly.

*Please be careful not to fall below the minimum horizontal period, otherwise the display may be dark.

We will check the display operation for your final setting of drive timing, so please inform us of your final setting.

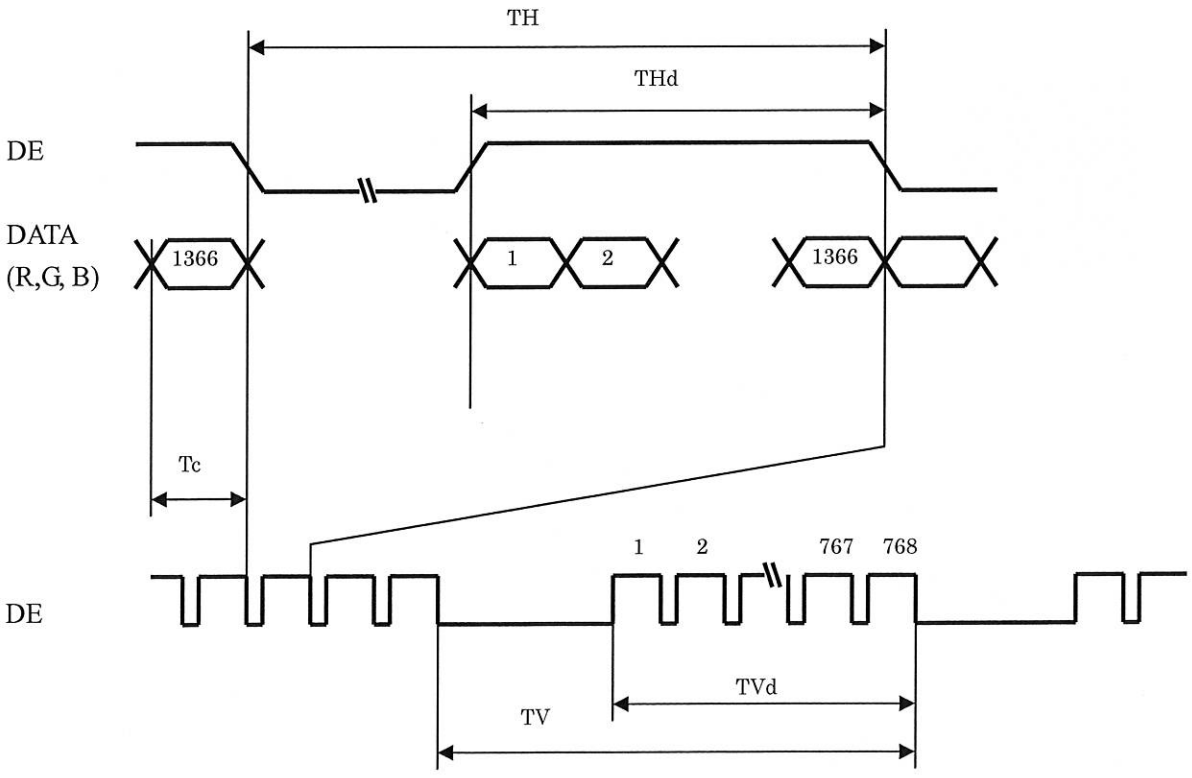


Fig.2 Timing diagram of input signals

7. Input signal, basic display colors and gray scale of each color

	Colors & Gray scale	Gray Scale	Data signal																							
			R0	R1	R2	R3	R4	R5	R6	R7	G0	G1	G2	G3	G4	G5	G6	G7	B0	B1	B2	B3	B4	B5	B6	B7
Basic Color	Black	–	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue	–	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Green	–	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Cyan	–	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Red	–	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Magenta	–	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	–	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	–	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale of Red	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	↓					↓								↓								↓			
	⇩	↓					↓								↓								↓			
	Brighter	GS253	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇩	GS254	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	GS255	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale of Green	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	↓					↓								↓								↓			
	⇩	↓					↓								↓								↓			
	Brighter	GS253	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	⇩	GS254	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Green	GS255	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale of Blue	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	⇧	↓					↓								↓								↓			
	⇩	↓					↓								↓								↓			
	Brighter	GS253	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1
	⇩	GS254	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
	Blue	GS255	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

0: Low level voltage 1: High level voltage

Each basic color can be displayed in 256 gray scales from 8 bit data signals. According to the combination of total 24 bit data signals, the 16,777,216 colors can be displayed on the screen.

8. Optical characteristics

Ta = 25°C, Vcc = +12V

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angle range	Horizontal	$\theta 21$ $\theta 22$	CR ≥ 10	70	88	-	Deg.	[Note1,4]
	Vertical	$\theta 11$ $\theta 12$		70	88	-	Deg.	
Contrast ratio		CRn	θ=0 deg.	2500	4000	-	-	[Note2,4]
Response time		τ_{DRV}		-	7	-	ms	[Note3,4,5]
Chromaticity of white		x		Typ.-0.03	0.278	Typ.+0.03	-	[Note 4]
		y		Typ.-0.03	0.285	Typ.+0.03	-	
Chromaticity of red		x		Typ.-0.03	0.599	Typ.+0.03	-	
		y		Typ.-0.03	0.333	Typ.+0.03	-	
Chromaticity of green		x		Typ.-0.03	0.287	Typ.+0.03	-	
		y		Typ.-0.03	0.569	Typ.+0.03	-	
Chromaticity of blue		x		Typ.-0.03	0.145	Typ.+0.03	-	
		y		Typ.-0.03	0.086	Typ.+0.03	-	
Luminance of white		Y_L		360	450		cd/m^2	[Note 4]
Luminance uniformity		δ_W		-	-	1.54	-	[Note 6]

*Optical characteristics are based on SHARP standard module.

*The measurement shall be executed 60 minutes after turning on.

[Note] The optical characteristics are measured using the following equipment.

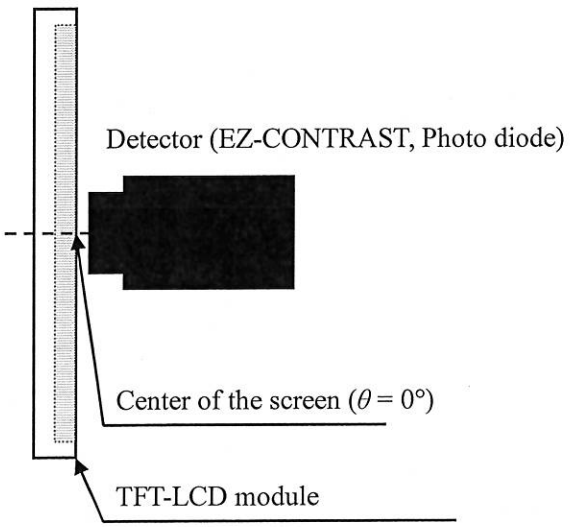


Fig.3-1 Measurement of viewing angle range and response time.
(Viewing angle range: EZ-CONTRAST
Response time: Photo diode)

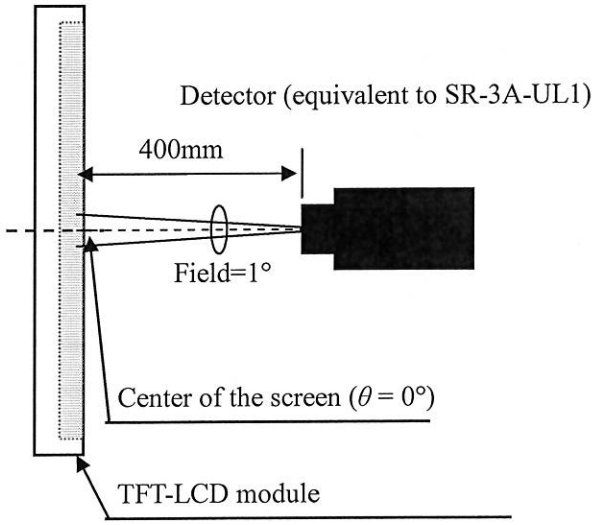
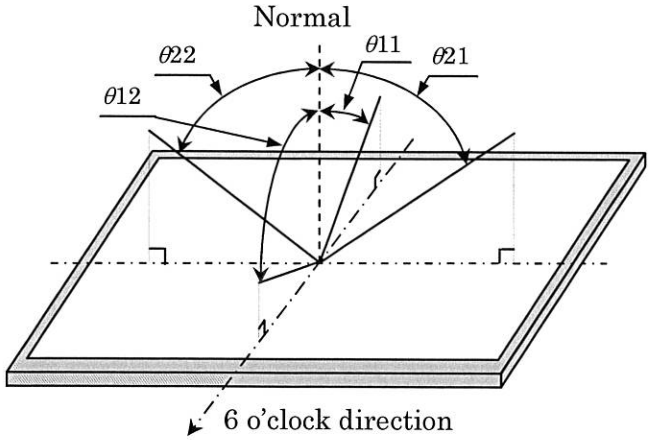


Fig.3-2 Measurement of Contrast, Luminance, and Chromaticity.

[Note 1] Definitions of viewing angle range:



[Note 2] Definition of contrast ratio:

The contrast ratio is defined as the following.

$$\text{Contrast ratio} = \frac{\text{Luminance (brightness) with all pixels white}}{\text{Luminance (brightness) with all pixels black}}$$

[Note 3] Definition of response time

The response time (τ_{DRV}) is defined as the following equation and shall be measured by switching the input signal from "any level of gray (0%, 25%, 50%, 75% and 100%)" to "any level of gray (0%, 25%, 50%, 75% and 100%)".

	0%	25%	50%	75%	100%
0%		tr: 0%-25%	tr: 0%-50%	tr: 0%-75%	tr: 0%-100%
25%	td: 25%-0%		tr: 25%-50%	tr: 25%-75%	tr: 25%-100%
50%	td: 50%-0%	td: 50%-25%		tr: 50%-75%	tr: 50%-100%
75%	td: 75%-0%	td: 75%-25%	td: 75%-50%		tr: 75%-100%
100%	td: 100%-0%	td: 100%-25%	td: 100%-50%	td: 100%-75%	

$\tau_{DRV} = \Sigma(t^*:x\text{-}y)/20$

t*:x-y...response time from level of gray(x) to gray(y)

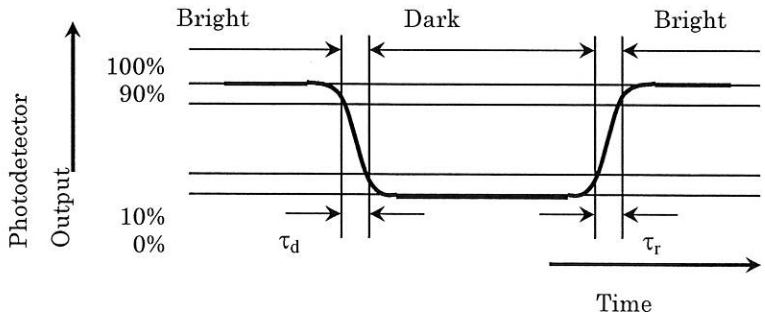


Fig.4 Response time of fall (τ_d) and rise (τ_r)

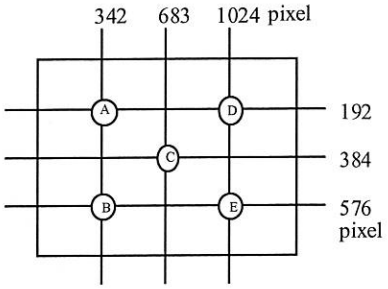
[Note 4] This shall be measured at center of the screen.

[Note 5] This value is valid when O/S driving is used at typical input timing.

[Note 6] Definition of white uniformity;

White uniformity is defined as the following with five measurements. (A-E)

$$\delta_W = \frac{\text{Maximum luminance of five points (brightness)}}{\text{Minimum luminance of five points (brightness)}}$$



9. Reliability

Reliability test item:

No.	Test item	Condition
1	High temperature storage test	Ta=60°C 240h
2	Low temperature storage test	Ta=-25°C 240h
3	High temperature and high humidity operation test	Ta=40°C ; 95%RH 240h (No condensation)
4	High temperature operation test	Ta=50°C 240h
5	Low temperature operation test	Ta=0°C 240h

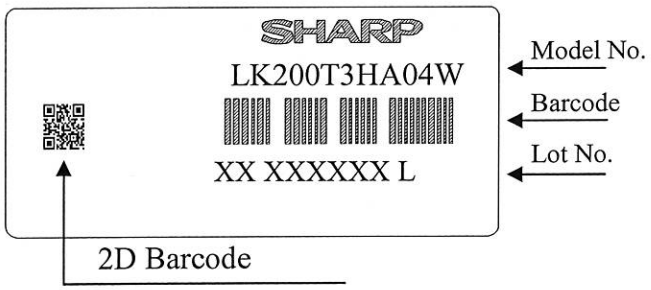
Above tests are executed under the CCFL module conditions.

10. Label

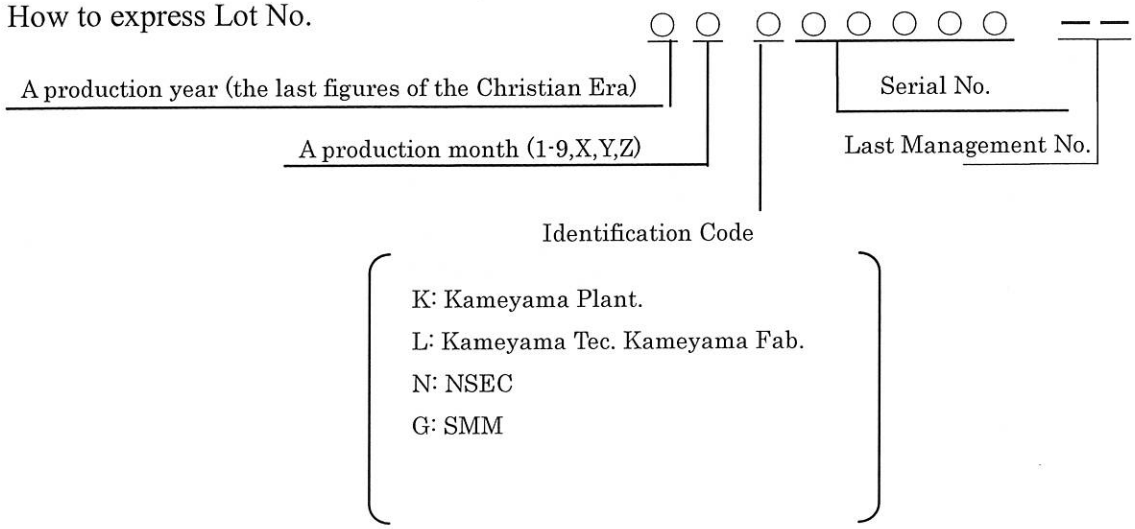
10.1. Lot No. label

The label stuck on a cell surface displays SHARP, product model (LK200T3HA04W) and a product Lot No.

(ex.) [LK200T3HA04W] JAPAN PRODUCTION



How to express Lot No.



10.2. Packing label

・Cell box

社内品番： LK200T3HA04W (①)

Bar code

ＬｏｔＮＯ. ・(１Ｔ) ＊＊＊＊.＊.＊＊ (②)

Bar code

Ｑｕａｎｔｉｔｙ： (Q) xx ｐｃｓ (③)

Bar code

ユーザ品番

Bar code

シャープ物流用ラベルです。

・Carton

社内品番： LK200T3HA04W (①)

Bar code

ＬｏｔＮＯ. ・(１Ｔ) ＊＊＊＊.＊.＊＊ (②)

Bar code

Ｑｕａｎｔｉｔｙ： (Q) xx ｐｃｓ (③)

Bar code

ユーザ品番

Bar code

シャープ物流用ラベルです。

① Management No
② Lot No. (Date)
③ Quantity

11. Packing form

a) Piling number of cartons: 32cell boxes / 1 palette.
b) Packing quantity in one cell box: 15 pcs
c) Carton size: 1050(W) × 1050(D) × 893(H)
d) Total mass of one carton filled with full modules: 388 kg(Max)

12. Carton storage condition

a) Temperature: 0°C to 40°C
b) Humidity: 95%RH or less
Reference condition: 20°C to 35°C, 85%RH or less (summer)
: 5°C to 15°C, 85%RH or less (winter)
The total storage time (40°C, 95%RH): 240H or less
c) Sunlight:
Be sure to shelter a product from the direct sunlight.
d) Atmosphere:
Do not store in a place where exists the risk of corrosive gas (such as acid and alkali) or volatile solvents.
e) Prevent condensation:
Be sure to put cartons on a palette or base, don't put it on the floor, and store them keeping off the wall.
Please take care of ventilation in storehouse and around cartons, and control temperature not to change abruptly beyond the natural environment.
f) Storage life: 6 months

13. Precautions

a) Because the Open-Cell is weak to static electricity, please do not touch the terminal with bare hands.

b) Since the front polarizer is easily damaged, pay attention not to scratch it.

c) Since long contact with drops of water may cause discoloration or spots, please wipe off them as soon as put on the screen.

d) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.

e) Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface. Handle with care.

f) Precautions of peeling off the protection film:

- Be sure to peel off slowly (recommended more than 7sec) and constant speed.
- Peeling direction shown in Fig. 5.
- Be sure to ground person with adequate methods such as the anti-static wrist band.
- Be sure to ground Source-Control PWB while peeling off the protection film.
- Ionized air should be blown to the surface while peeling off.
- The protection film must not touch drivers and Source-Control PWB.
- If adhesive may remain on the polarizer after the protection film peeled off, please remove with isopropyl-alcohol.

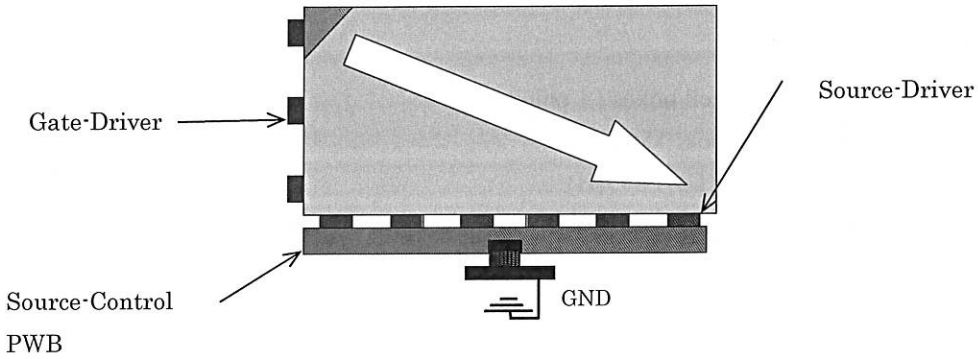


Fig.5 Direction of peeling off

g) Since the Open-Cell consists of TFT and electronic circuits with CMOS-ICs, which are very weak to electrostatic discharge, persons who are handling a Open-Cell should be grounded through adequate methods such as an anti-static wrist band. Connector pins should not be touched directly with bare hands.

・Reference: Process control standard of sharp

	Item	Management standard value and performance standard
1	Anti-static mat(shelf)	1 to 50 [Mega ohm]
2	Anti-static mat(floor, desk)	1 to 100 [Mega ohm]
3	Ionizer	Attenuate from ±1000V to ±100V within two seconds.
4	Anti-static wrist band	0.8 to 10 [Mega ohm]
5	Anti-static wrist band entry and ground resistance	Below 1000 [ohm]
6	Temperature	22 to 26 [°C]
7	Humidity	60 to 70 [%]

h) Since the Open-Cell has some PWBs, please take care to keep them off any stress or pressure when handling or installing the Open-Cell, otherwise some of electronic parts on them may be damaged.

i) Be sure to turn off the power supply when inserting or disconnecting the cable.

j) Be sure to design the module and cabinet so that the Open-Cell can be installed without any extra stress such as warp or twist.

k) When handling and assembling Open-Cells into module and cabinets, please be noted that long-term storage in the environment of oxidization or deoxidization gas and the use of materials such as reagent, solvent, adhesive, resin, etc. which generate these gasses, may cause corrosion and discoloration of the Open-Cell.

l) Applying too much force and stress to PWBs and drivers may cause a malfunction electrically and mechanically.

m) The Open-Cell has high frequency circuits. Sufficient suppression to EMI should be done by system manufactures.

n) Please be careful since image retention may occur when a fixed pattern is displayed for a long time.

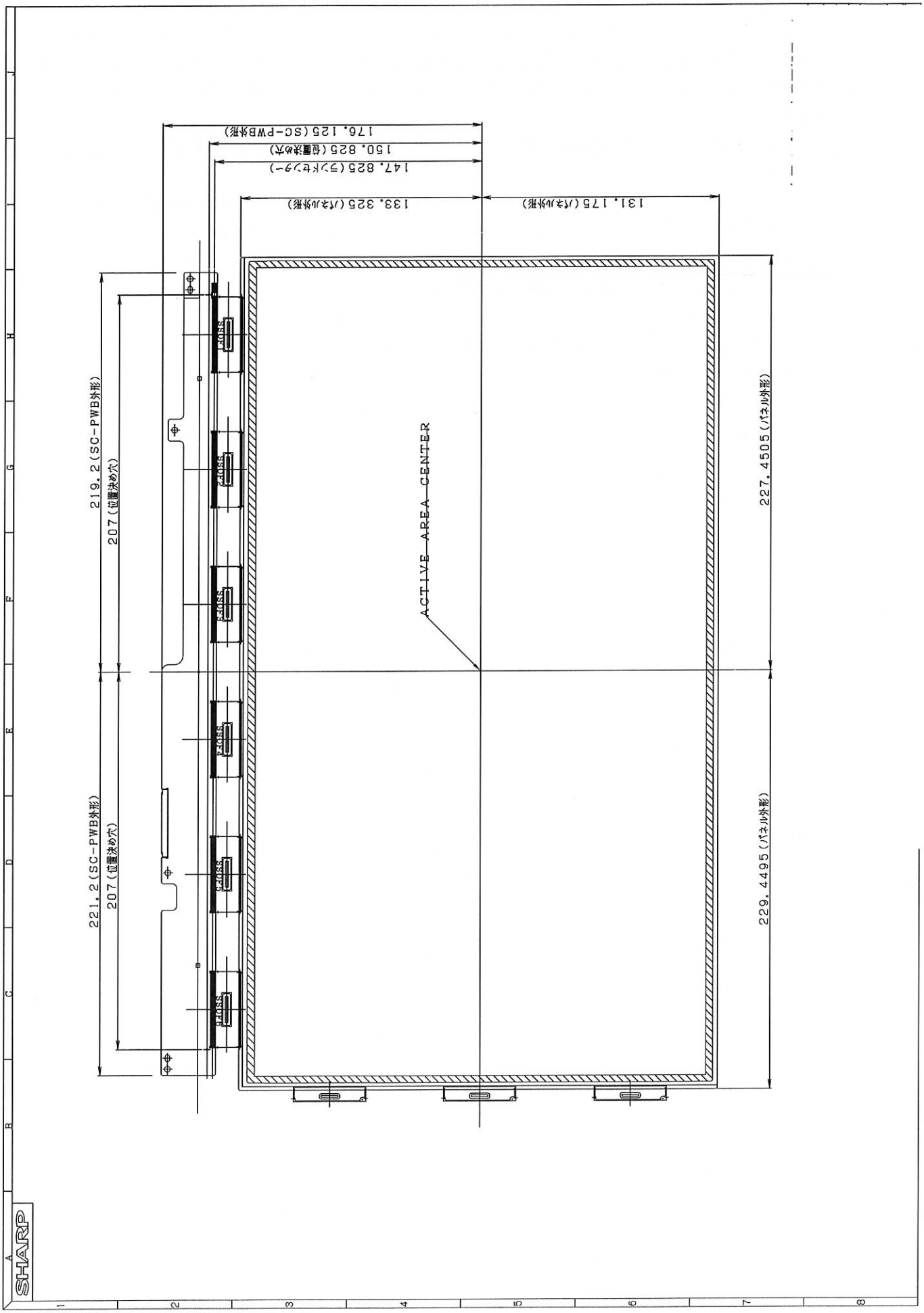
o) The chemical compound, which causes the destruction of ozone layer, is not being used.

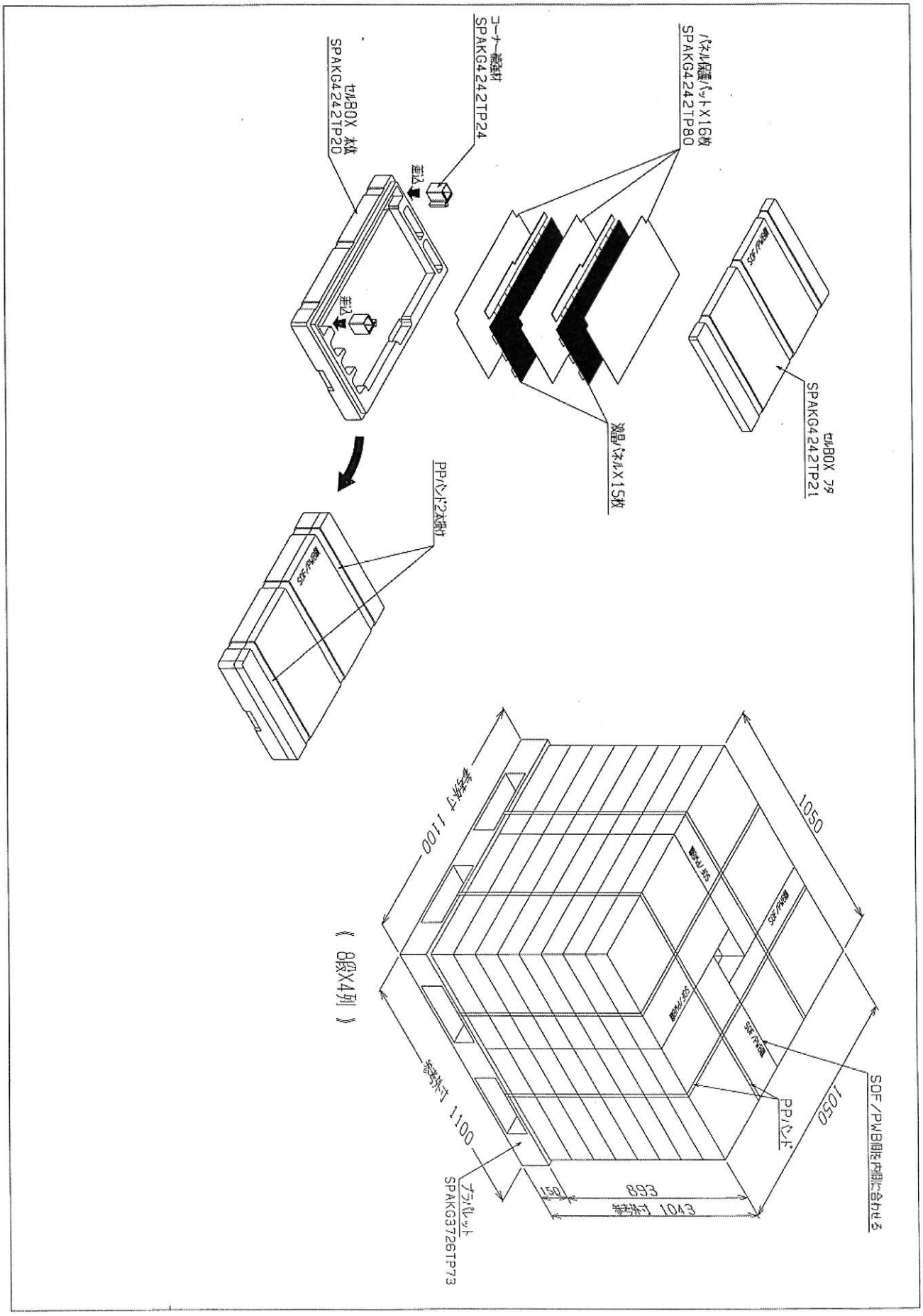
p) This Open Cell has some black stains.

q) This Open-Cell module is corresponded to RoHS.

r) When any question or issue occurs, it shall be solved by mutual discussion.

s) Please design the heat dissipation of the module with enough care for Source-Control PWB, Source-driver and Gate-driver's IC.


176.125(SC-PWB外形)
150.825(位置決め穴)
147.825(ランドセンター)
133.325(パネル外形)
131.175(パネル外形)
219.2(SC-PWB外形)
207(位置決め穴)
221.2(SC-PWB外形)
207(位置決め穴)
ACTIVE AREA CENTER
227.4505(パネル外形)
229.4495(パネル外形)
SSOP1
SSOP2
SSOP3
SSOP4
SSOP5
SSOP6
SSOP7
SSOP8
SHARP


セルBOX 蓋
SPAKG4242TP21
パネル保護パットX16枚
SPAKG4242TP80
コーナー補強材
SPAKG4242TP24
セルBOX 本体
SPAKG4242TP20
差込
差込
緩衝パネルX15枚
PPバンド2本掛け
SOF/PWB間隔に合わせる
1050
1050
PPバンド
1100
1100
ブラパレット
SPAKG3726TP73
150
883
1043
《 8段X4列 》